ciliated infusoria; arthropods; (copepods, amphipods; ostracods; decapod larvæ and larval tracheata); rotifers; annelid larvæ; ctenophores; medusæ. In its general character it more closely resembles Haliplankton than Limnoplankton, the marked exceptions being the presence of rotifers and the absence of cladocera.

It has been frequently observed and recorded that copepods come to the surface in vast numbers at night. We have frequently observed that on certain days they are at the surface in equal abundance. Their presence at the surface appears to be independent of light and darkness, or of meteorological conditions, but correlated with the presence at the surface of certain species of diatoms, or of quantities of algal débris; observations confirming the belief that these diatoms and amorphous organic materials are the principal food of copepods and of young decapod larvæ.

Rotifers occur in great abundance during July, August and September, but we have found them at the surface only during the day, and near the bottom during the night.

Cordylophora and a nudibranch mollusc are found in water whose specific gravity never rises above 1.005.

Investigations are now in progress to discover the cause of the phenomena noted by us, that ctenophores and medusæ (*Dactylometra*), which are brought into the pond by the tide, are checked in their growth, and after several months of residence in the pond show but a very slight increase in size. The same causes have possibly resulted in the various species of *Nereis Balanus*, and molluscs described as inhabiting only brackish water, and which differ from similar marine species mainly in their smaller size.

Our earlier methods of plankton collection were by means of fine nets, and by sand filtration of known volumes of water after the method of Henson, Reighard, Sedgwick-Rafter, Peck and others, but these have been superseded by use of the *Planktonokrit*, invented and described by Dr. C. S. Dolley.* The centrifugal method is a distinct advance, and materially reduces the error when dealing with all organisms thus far met with, except the Cyanophyceæ. But with steam power it is confidently expected that enough centrifugal force can be developed to throw out even these.

The machine is particularly valuable as a rapid, sure method for collecting the microscopic plankton, and its use will disclose many forms hitherto rare or unknown. As used by us, the two reservoirs, each of one litre capacity, are filled with water drawn from a known depth by means of a valved tin tube. For control purposes both reservoirs are used. After revolving 2 to 5 minutes the volume of organic matter is read on the graduated tube; the tubes are then unscrewed, and the contents washed out by a pipette and filtered distilled water into a tube of narrow lumen graduated to $\frac{1}{100}$ of a cc. After settling for the necessary time, either with or without treatment with Formalin, the volume is read and compared with the volume noted upon the graduated tube of the reservoir. This is necessary from the fact that certain forms are packed more closely than are others by the centrifugal force. The volume of water is then made 5 cc.; the organisms are distributed evenly by gentle shaking or by a pipette, and the number of individuals of each species is enumerated according to the Sedgwick-Rafter method.

Nocturnal Protective Coloration of Mammals, Birds, Fishes and Insects. A. E. VERRILL.

Much has been written in respect to the imitative and and protective colors of mammals, birds, insects, etc., and the bearing of these facts on natural selection, to which

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they are unquestionably due, is well known. Nearly all the cases cited by authors relate to colors as seen by daylight. I wish to call attention to the importance of studying the forms and colors of animals with reference to their appearance and protective value as seen by moonlight, starlight and in the dusk of early morning or the twilight of evening, when vast numbers of insects, birds, small mammals, etc., are most in need of protection against their predacious enemies, which generally hunt their prey at such times. The danger to most birds and to diurnal insects is due to their sleeping more or less exposed to view, but the danger to most of the smaller mammals and nocturnal insects, fishes, etc., is due to the fact that they are most active at night or in the twilight, and therefore more easily observed by their enemies. Moreover, the predacious species need protective or imitative colors at night, in order to approach their prey unobserved.

Moonlight and skylight give very black shadows in which dark brown, dark gray and black animals are nearly or quite invisible. Black shadows of foliage are apt to be broken up by patches of white moonlight. Therefore patches of white or light yellow on dark or black animals are imitative of such moonlight effects, and as they serve to break up the dark outlines of beast or bird, they are very effective as a protection at night.

Thus we find among nocturnal carnivores many instances of black colors, as the mink, fisher, bear, etc., and of black and white ones, as the skunk, badger, etc. So among the small species preyed upon, there are numerous birds that are black, black and white, black and yellow, etc. All such strongly contrasted colors are more likely to be of value for protection at night than in the daytime. This also applies to the butterflies and other bright colored diurnal insects whose colors often have no obvious relation to their diurnal surroundings, but blend with the colors of the flowers or foliage on which they roost at night. Many of our large red and brown butterflies of the genus *Argynnis*, etc., have bright silvery spots on the under side of the wings, so that they are conspicuous objects in the daytime. But I have observed them at roost on the golden-rods and other favorite flowers by moonlight, when the colors of their folded wings blend well with those of the flowers, and their silvery spots glisten like the dewdrops around them. Thus their conspicuous markings become protective at night.

A great number of field mice, shrews, moles, etc., have dark gray or grayish brown colors, more or less like the common rat and mouse. Such animals are nocturnal in their habits, usually hiding in holes by day. Their colors are not protective in the daylight amongst green herbage, but at night they are eminently so, for they are almost invisible in green grass, if quiet, as I have often observed, even in good moonlight. Animals that live among the stalks of reeds or shrubs may gain protection by having conspicuous dark stripes. No doubt the tiger is better concealed by his stripes, while in his native haunts, in the night than in the daytime. The same is true of the leopard and jaguar, and perhaps of the zebra. Many fishes that rest at night among eel grass and sea weeds have conspicuous transverse or longitudinal black stripes, which are highly protective in a dim light, for they look like the dark stems and shadows of the weeds, and serve to break up or conceal the outline of the fish. Black tails and fins serve the same purpose. Such markings of fishes are often more conspicuous at night than in the daytime. All the cases referred to above seem to be the direct results of long-continued natural selection.